

AMENDMENTS TO THE CLAIMS

Claim 1 (currently amended): A method for recording holograms in holographic storage media, comprising:

propagating a reference beam to a holographic storage medium; and
illuminating a data mask with a beam and recording to produce a modulated beam,
the modulated beam incident the holographic storage medium to interfere and record an
interference between the a resulting modulated beam and the reference beam in [[a]] the
holographic storage medium, wherein the data mask includes an information layer that is
divided into multiple data pages, and each data page comprises a plurality of pixels; and
propagating a reference beam to the holographic storage medium to record the
multiple data pages of the data mask in parallel in the holographic storage medium.

Claim 2 (original): The method of claim 1, wherein the recorded data pages are separated by approximately 1 micron to 10 mm.

Claim 3 (original): The method of claim 1, wherein the recorded data pages spatially overlap.

Claim 4 (currently amended): The method of claim 1, wherein [[the]] an image of the information layer is propagated to a plane located outside of the holographic storage medium.

Claim 5 (withdrawn): The method of claim 1, wherein the information layer is propagated to the holographic storage medium with a VanderLugt imaging system.

Claim 6 (withdrawn): The method of claim 1, further including positioning the holographic storage medium near a Fourier transform plane of the data mask.

Claim 7 (currently amended): The method of claim 1, further including positioning the holographic storage medium near an image plane of the data mask modulated beam.

Claim 8 (currently amended): The method of claim 1, wherein the data mask modulated beam is propagated to the holographic storage medium without a lens.

Claim 9 (currently amended): The method of claim 1, wherein the object modulated beam is confocally multiplexed to record multiple data masks.

Claim 10 (original): The method of claim 1, wherein the holographic storage medium includes a rectangular card.

Claim 11 (original): The method of claim 1, wherein the holographic storage medium includes a disc.

Claim 12 (withdrawn): The method of claim 1, wherein the data mask includes a lithographic data mask adapted to image the information layer.

Claim 13 (withdrawn): The method of claim 1, wherein the data mask includes a spatial light modulator adapted to image the information layer.

Claim 14 (withdrawn): The method of claim 1, wherein the holographic storage medium includes a polytopic or angle filter.

Claim 15 (original): The method of claim 1, wherein the data mask includes a holographic storage medium having a previously recorded information layer.

Claim 16 (original): The method of claim 1, wherein the data mask includes a holographic storage medium with a plurality of previously recorded information layers having multiple data pages therein.

Claim 17 (withdrawn): The method of claim 16, wherein the plurality of information layers are multiplexed onto the holographic storage medium using at least one multiplexing technique.

Claim 18 (withdrawn): The method of claim 1, wherein a plurality of information layers are multiplexed onto the holographic storage medium using at least one multiplexing technique.

Claim 19 (withdrawn): The method of claim 18, wherein successive information layers having multiple data pages are aligned to define multiple stacks of data pages.

Claim 20 (withdrawn): The method of claim 18, wherein successive information layers having multiple data pages are aligned in a preselected arrangement such that authenticity of the medium may be determined.

Claim 21 (withdrawn): The method of claim 18, wherein the information layers are both polytopic and wavelength multiplexed.

Claim 22 (original): The method of claim 1, wherein the holographic storage medium includes holographic read only memory.

Claim 23 (original): A holographic storage medium recorded by the method of claim 1.

Claim 24 (currently amended): A data mask for storing information in a holographic medium, comprising:

a data mask having an information layer adapted to be relayed and recorded into a holographic medium, wherein the information layer is grouped into a plurality of data pages, and each data page comprises a plurality of pixels.

Claim 25 (withdrawn): The data mask of claim 24, wherein the data mask includes a lithographic mask.

Claim 26 (cancelled)

Claim 27 (withdrawn): The data mask of claim 24, wherein the data mask includes a spatial light modulator.

Claim 28 (original): The data mask of claim 24, wherein the data mask includes multiple information layers.

Claim 29 (withdrawn): The data mask of claim 24, wherein the multiple layers may be stored through one or more multiplexing methods.

Claim 30 (currently amended): A system for recording holograms in holographic storage media, comprising:

a light source; and
a data mask having an information layer adapted to be relayed modulate an object beam and interfere with a reference beam for recording an interference pattern associated with the information layer to record into a holographic storage medium, wherein the information layer is grouped into a plurality of data pages, and each data page comprises a plurality of pixels.

Claim 31 (withdrawn): The system of claim 30, further including a VanderLugt imaging system.

Claim 32 (withdrawn): The system of claim 30, wherein the holographic storage medium is positioned near the Fourier transform plane of the information layer.

Claim 33 (withdrawn): The system of claim 30, wherein the holographic storage medium is positioned near the Fourier transform plane of the data mask.

Claim 34 (withdrawn): The system of claim 30, further including a filter at the Fourier transform plane of the data mask.

Claim 35 (currently amended): The system of claim 30, further including a repositioning mechanism adapted to move at least one of the data mask, the holographic storage medium, and an optical element, wherein the optical element is positioned to relay an image of the data mask to the holographic storage medium.

Claim 36 (withdrawn): The system of claim 30, further including an optical element for each data page of the data mask.

Claim 37 (withdrawn): The system of claim 30, further including a phase mask.

Claim 38 (withdrawn): The system of claim 30, further including a 4-F optical system.

Claim 39 (withdrawn): The system of claim 30, further including substantially telecentric optical elements.

Claim 40 (original): The system of claim 30, wherein the data mask includes a holographic storage medium.

Claim 41 (withdrawn): The system of claim 30, wherein the data mask includes a spatial light modulator.

Claim 42 (original): The system of claim 30, wherein the data mask includes a holographic storage material with the information layer stored therein.

Claim 43 (currently amended): A method for recording holograms in holographic storage media, comprising:

propagating a reference beam to a holographic storage medium; and
illuminating a holographic master data mask to reconstruct a stored information layer
from the holographic master data mask and produce a modulated beam, the modulated
beam incident the holographic storage medium to interfere with the reference beam and
record an interference between the modulated beam and the reference beam with the
information layer onto a holographic storage medium with an object beam, wherein the
holographic master data mask includes a holographic storage material, and the
information layer comprises a layer of data divided into multiple data pages that are
recorded in parallel, wherein each data page comprises a plurality of pixels; and
propagating a reference beam to the holographic storage medium to record the
information layer.

Claim 44 (cancelled)

Claim 45 (withdrawn): The method of claim 43, wherein two or more information layers are stored in the holographic master data mask and multiplexed to store multiple information layers in the holographic storage medium

Claim 46 (cancelled)

Claim 47 (withdrawn): The method of claim 43, wherein the holographic master data mask is imaged with a VanderLugt imaging system onto the holographic storage medium.

Claim 48 (withdrawn): The method of claim 43, wherein the holographic storage medium is positioned near the Fourier transform plane of the at least one information layer of the holographic master data mask when recording onto the holographic storage medium.

Claim 49 (withdrawn): The method of claim 48, further including a filter at the Fourier transform plane of the holographic master data mask when recording onto the holographic storage medium.

Claim 50 (withdrawn): The method of claim 43, wherein the holographic storage medium is recorded in a substantially telecentric system.

Claim 51 (withdrawn): The method of claim 43, wherein multiple information layers are confocally stored in the holographic master, and confocally multiplexed onto the holographic storage medium when recording.

Claim 52 (withdrawn): The method of claim 43, wherein multiple information layers are polytopically stored in the holographic master, and polytopically multiplexed onto the holographic storage medium when recording.

Claim 53 (original): A holographic storage medium recorded by the method of claim 43.

Claim 54 (withdrawn): A method for recording information into a holographic media, comprising:

positioning a holographic storage medium near a quasi Fourier transform plane of a data mask having information to be stored therein;

storing the information from the data mask in the holographic storage medium, wherein the data mask includes a plurality of data pages that are recorded onto the holographic medium in parallel.

Claim 55 (withdrawn): The method of claim 54, wherein placing the holographic medium near a quasi Fourier transform plane includes a VanderLugt imaging system.

Claim 56 (withdrawn): The method of claim 54, further including a filter at the Fourier transform plane.

Claim 57 (withdrawn): The method of claim 54, wherein the holographic medium is recorded in a substantially telecentric system.

Claim 58 (withdrawn): The method of claim 58, further including at least one of Bragg based multiplexing and momentum based multiplexing.

Claim 59 (withdrawn): The method of claim 54, wherein the data mask includes a holographic storage medium.

Claim 60 (withdrawn): A holographic storage medium recorded by the method of claim 54.

Claim 61 (withdrawn): A method for recording information into a holographic storage medium, comprising:

confocally multiplexing a plurality of data masks into a holographic storage medium at two or more different distances from the center of the holographic storage medium, wherein at least one of the data masks includes an information layer divided into a plurality of data pages.

Claim 62 (withdrawn): The method of claim 61, further including varying a lens to store the plurality of data masks at two or more different distances.

Claim 63 (withdrawn): The method of claim 61, further including varying the image plane to store the plurality of data masks at two or more different distances.

Claim 64 (withdrawn): The method of claim 61, further including varying a relative position of the holographic storage medium to store the plurality of data masks at two or more different distances.

Claim 65 (withdrawn): The method of claim 61, further including storing at least a portion of the data masks stored in the holographic storage medium into a second holographic storage medium.

Claim 66 (withdrawn): The method of claim 65, wherein the stored data masks are stored in the second holographic storage medium through confocal multiplexing.

Claim 67 (withdrawn): The method of claim 61, wherein the data masks are readout of the holographic storage medium through confocal multiplexing.

Claim 68 (withdrawn): The method of claim 61, wherein the plurality of data masks are formed by a spatial light modulator.

Claim 69 (withdrawn): A holographic storage medium recorded by the method of claim 61.

Claim 70 (withdrawn): A method for reading information from a holographic storage medium that was stored confocally, comprising:

illuminating a holographic storage medium including multiple information layers having multiple data pages centered at different locations on the holographic storage medium with a readout beam;

confocally filtering the resulting reconstruction to select a desired information layer; and

detecting at least a portion of an entire data page of the selected information layer in parallel.

Claim 71 (withdrawn): The method of claim 70, wherein confocally filtering includes disposing an array of pinholes at the image plane.

Claim 72 (withdrawn): The method of claim 70, further including varying the distance of the detector to the holographic storage medium to select the desired information layer.

Claim 73 (withdrawn): The method of claim 70, further including varying at least a portion of a lens system to select the desired information layer.

Claim 74 (withdrawn): The method of claim 70, further including varying the position of at least one of an image plane and detector plane to select the desired information layer.

Claim 75 (withdrawn): A method for reading information stored in holographic storage media, comprising,

illuminating a holographic storage medium with a reference beam;

detecting information stored in the holographic storage medium with a detector placed at a distance from the holographic storage medium, wherein,

the holographic storage medium includes at least one information layer divided into a plurality of data pages stored therein and adapted to be detected at the distance of the detector.

Claim 76 (withdrawn): The method of claim 75, wherein detecting information includes detecting an entire data page in parallel.

Claim 77 (withdrawn): The method of claim 75, wherein detecting information further includes detecting a line of a data page at a time and scanning the line detector across the data page.

Claim 78 (withdrawn): The method of claim 75, further including detecting multiple data pages in a pagewise fashion.

Claim 79 (withdrawn): The method of claim 75, wherein detecting information includes using a phase conjugate reference beam.

Claim 80 (withdrawn): The method of claim 75, wherein a holographic optical element is placed adjacent the detector.

Claim 81 (withdrawn): The method of claim 75, further including repositioning at least one of the detector and the holographic storage medium to detect at least a second data page.

Claim 82 (withdrawn): The method of claim 75, further including repositioning at least one of the detector and the holographic storage medium to detect at least a second information layer.

Claim 83 (withdrawn): The method of claim 75, further including multiplexing the holographic storage medium to readout information from different information layers.

Claim 84 (withdrawn): The method of claim 83, wherein the multiplexing includes wavelength multiplexing.

Claim 85 (withdrawn): The method of claim 83, wherein the multiplexing includes polytopic multiplexing.

Claim 86 (withdrawn): The method of claim 83, wherein the multiplexing includes wavelength and polytopic multiplexing.

Claim 87 (withdrawn): The method of claim 75, wherein the detector includes at least one of a CMOS and CCD detector array.

Claim 88 (withdrawn): The method of claim 75, wherein the detector oversamples the stored information.

Claim 89 (withdrawn): A method for reading information stored in a holographic storage medium, comprising:

aligning a detector with a single data page stored in a holographic storage medium at a first location, wherein the storage medium includes multiple data pages centered at different locations across the medium;

detecting information from the data page at the first location in parallel; and
multiplexing the holographic storage medium to readout additional data pages in a stack of data pages at the first location.

Claim 90 (withdrawn): The method of claim 89, further including aligning the detector with a second stack of data pages centered at a second location to detect data pages of the second stack.

Claim 91 (withdrawn): The method of claim 89, wherein the act of multiplexing includes wavelength multiplexing.

Claim 92 (withdrawn): The method of claim 91, wherein the wavelengths are varied for wavelength multiplexing with a tunable source including an electroabsorptive modulated laser.

Claim 93 (withdrawn): The method of claim 91, wherein the wavelengths are varied for wavelength multiplexing with a tunable source that includes a MEMs structure on a laser cavity.

Claim 94 (withdrawn): The method of claim 89, wherein a readout light source includes a laser that is pulsed.

Claim 95 (withdrawn): The method of claim 89, wherein the multiplexing includes polytopic multiplexing.

Claim 96 (withdrawn): The method of claim 89, wherein the multiplexing includes both wavelength and polytopic multiplexing.

Claim 97 (withdrawn): The method of claim 89, wherein an alignment between different data pages in a single stack of data pages is determined.

Claim 98 (withdrawn): The method of claim 97, wherein the determined alignment is used to authenticate the holographic storage medium.

Claim 99 (withdrawn): The method of claim 89, wherein detecting information includes a phase conjugate beam and a phase conjugate readout system.

Claim 100 (withdrawn): The method of claim 99, wherein the phase conjugate readout system is associated with the holographic storage medium.

Claim 101 (withdrawn): The method of claim 99, wherein the phase conjugate readout system includes a phase mask.

Claim 102 (withdrawn): A system for reading information stored in holographic storage media, comprising:

- a light source; and
- a detector, wherein the detector is adapted to detect multiple data pages stored in a holographic storage medium in a page-wise fashion.

Claim 103 (withdrawn): The system of claim 102, wherein the detector includes an array of sensor elements.

Claim 104 (withdrawn): The system of claim 102, wherein the detector includes at least one of a CMOS and CCD sensor array.

Claim 105 (withdrawn): The system of claim 102, wherein the detector includes a line scanner.

Claim 106 (withdrawn): The system of claim 102, further including a repositioning mechanism to move the detector relative to the holographic storage medium.

Claim 107 (withdrawn): The system of claim 102, further including a repositioning mechanism adapted to move at least one of the detector, the holographic storage medium, and an optical element.

Claim 108 (withdrawn): The system of claim 102, further including a holographic optical element.

Claim 109 (withdrawn): The system of claim 102, further includes a holographic optical element disposed adjacent the detector.

Claim 110 (withdrawn): The system of claim 102, wherein the detector detects the data pages without an optical lens.

Claim 111 (withdrawn): The system of claim 102, wherein the light source includes a laser.

Claim 112 (withdrawn): The system of claim 102, wherein the laser is configured to be pulsed.

Claim 113 (withdrawn): The system of claim 102, wherein a wavelength of the laser may be varied.

Claim 114 (withdrawn): The system of claim 102, wherein the light source includes a tunable source having an electroabsorptive modulated laser.

Claim 115 (withdrawn): The system of claim 102, wherein the light source includes a tunable source having a MEMs structure on a laser cavity.

Claim 116 (withdrawn): The system of claim 102, further including a phase mask.

Claim 117 (withdrawn): The system of claim 102, further including a filter adapted to block out unwanted reconstructions.

Claim 118 (withdrawn): The system of claim 102, further including a polytopic filter.

Claim 119 (withdrawn): The system of claim 102, further including a filter disposed between the detector and the holographic storage medium.

Claim 120 (withdrawn): The system of claim 119, wherein the filter includes an array of pinholes.